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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.
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09/320,271 05/27/99 WATANABE

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EXAMINER

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ART UNIT	PAPER NUMBER
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2825

DATE MAILED:

02/12/01

Please find below and/or attached an Office communication concerning this application or proceeding.

Commissioner of Patents and Trademarks

Office Action Summary

Application No.
09/320,271

Applicant(s)

Hiroyuki WATANABE et al.

Examiner

Calvin Lee

Group Art Unit
2825



☒ Responsive to communication(s) filed on Dec 26, 2000

☐ This action is **FINAL**.

☐ Since this application is in condition for allowance except for formal matters, **prosecution as to the merits is closed** in accordance with the practice under *Ex parte Quayle*, 35 C.D. 11; 453 O.G. 213.

A shortened statutory period for response to this action is set to expire 3 month(s), or thirty days, whichever is longer, from the mailing date of this communication. Failure to respond within the period for response will cause the application to become abandoned. (35 U.S.C. § 133). Extensions of time may be obtained under the provisions of 37 CFR 1.136(a).

Disposition of Claim

- ☒ Claim(s) 1-13 is/are pending in the application.
- Of the above, claim(s) _____ is/are withdrawn from consideration.
- ☐ Claim(s) _____ is/are allowed.
- ☒ Claim(s) 1-13 is/are rejected.
- ☐ Claim(s) _____ is/are objected to.
- ☐ Claims _____ are subject to restriction or election requirement.

Application Papers

- ☐ See the attached Notice of Draftsperson's Patent Drawing Review, PTO-948.
- ☐ The drawing(s) filed on _____ is/are objected to by the Examiner.
- ☐ The proposed drawing correction, filed on _____ is ☐ approved ☐ disapproved.
- ☐ The specification is objected to by the Examiner.
- ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. § 119

- ☒ Acknowledgement is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d).
- ☒ All ☐ Some* ☐ None of the CERTIFIED copies of the priority documents have been received.
- ☐ received in Application No. (Series Code/Serial Number) _____.
- ☐ received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

*Certified copies not received: _____

- ☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. § 119(e).

Attachment(s)

- ☒ Notice of References Cited, PTO-892
- ☐ Information Disclosure Statement(s), PTO-1449, Paper No(s). _____
- ☐ Interview Summary, PTO-413
- ☐ Notice of Draftsperson's Patent Drawing Review, PTO-948
- ☐ Notice of Informal Patent Application, PTO-152

— SEE OFFICE ACTION ON THE FOLLOWING PAGES —

OFFICE ACTION

Response to Amendment

1. The Request for Reconsideration received December 26, 2000 is acknowledged.

Claim Rejections - 35 USC § 112

2. Claims 1-13 are rejected under 35 U.S.C. 112, second paragraph, as being vague for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

The formation of the first insulating layer is on the silicon oxide film overlying a substrate, but not directly on a substrate (page 7). Additionally, in claim 11, "third mask" is under as no other mask (i.e., first mask, second mask) is recited in claim

Claim Rejections - 35 U.S.C. § 103

3. Claims 1-13 are rejected under 35 U.S.C. 103(a) as being unpatentable over *Watanabe et al.* (US 6,017,807) in view of *Mizuhara et al.* (US 5,898,221).

a) *Watanabe* teaches a method of a semiconductor device, comprising the steps:

- forming a first insulating layer **8** of organic SOG, containing 1% of carbon, on an interconnection and on an oxide film 5 overlying a substrate **1** (col. 5 line 17 through col. 6 line 30)
- introducing impurities into the insulating layer (Fig. 4) so the impurities arrive at the interface between the insulating layer and the oxide film (col. 6 line 39 and col. 7 line 32)

Note: the implantation at the interface between organic SOG layer **8** and oxide film **5** prevents modified SOG layer **9** (col. 6 line 53) from being easily peeled off from the oxide film (col. 6 lines 52-59 and col. 7 lines 30-37)

- forming a contact hole **10** in the insulation layer using a mask pattern (col. 8 lines 52-63)
- embedding and forming a first conductive layer **11** over the hole (Fig. 5 and col. 7 lines 9-29)

The method can be repeated to form a conventional multilayer structure having second, third, and fourth interconnections, as desired.

b) However, *Watanabe* is silent about forming the SOG layer on a flat underlying face. Nevertheless, such flat underlying face is well known in the semiconductor processing art as evidenced by *Mizuhara* disclosing a modified SOG **10** formed on an oxide film **8** overlying a flat substrate's face (Figs. 6-9 and cols 4-5).

Therefore it would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the SOG formation of *Watanabe* by utilizing a flat substrate's face. The motivation to do so would have been to simply have a uniform film thickness

Response to Arguments

4. Applicants argument that claims of the present invention do not contain the limitation found in claims 1-12 of the '807 patent --forming an interconnection on a substrate-- is persuasive. Therefore, 35 USC 101 rejections are withdrawn. However, the specific portions of *Watanabe*, relied upon by the Examiner to reject the claims, have been specifically pointed out in details in the new rejections above.

Applicants argued that "... the lower layer portion of the organic SOG film will include a portion that is modified and a portion that is not modified ... Therefore, the organic SOG film is formed on a flat underlying face". Examiner notes that in *Watanabe* the organic SOG film is

modified into an SOG film ... having high adhesion with the underlying film and silicon oxide film” (col. 6 lines 52-59 and col. 7 lines 30-37).

It means the SOG film of *Watanabe* does reduce in moisture and becomes less hygroscopic (which meets the scope/object of the present invention) whether there is an underlying interconnection or not. Perhaps, the interconnection, which may affect the film thickness of the SOG film, has no uneven surface.

Conclusion

5. Any inquiry concerning this communication from the Examiner should be directed to *Calvin Lee* at (703) 306-5854 from 7:00AM to 5:00PM (Monday through Thursday). If attempts to reach the examiner by telephone are unsuccessful, Art Unit 2825's Supervisory Patent Examiner *Matthew Smith* whose telephone number is (703) 308-1323.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the Group receptionist whose telephone number is (703) 308-0956 or (703) 306-3329.

CL

February 9, 2001



MATTHEW SMITH
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2800